WE CLAIM:

1. A machine-readable medium for programming a computer to determine feature relating tolerance consumed for a plurality of manufactured features on an object, said medium comprising processor executable instructions for

5   determining a true position for each of said plurality of manufactured features;

        determining a location for each of said plurality of manufactured features;

        organizing each of said true positions into a single association;

10   organizing the location of each of said plurality of manufactured features relative to said single association;

        determining a circle that intersects or contains each location;

        determining the diameter of said circle; and

        comparing the diameter of said circle with said feature relating

15 tolerance to determine acceptability of the pattern.

2. The machine-readable medium of Claim 1 where said manufactured feature comprises a hole.

3. The machine-readable medium of Claim 1 where said processor executable instruction of determining a true position for each of said plurality of manufactured features comprises

        determining a designed center for each of a plurality of

5   manufactured holes.

4. The machine-readable medium of Claim 1 where said processor executable instruction of organizing each of said true positions into a single association comprises

superimposing said true positions to determine a one true position.

5.   The machine-readable medium of Claim 1 where said processor executable instruction of organizing the location of each of said plurality of manufactured features relative to said single association comprises

organizing the location of manufactured holes relative to a one
5   true position.

6.   The machine-readable medium of Claim 5 where said one true position is an arbitrarily positioned origin on an x, y coordinate system.

7.   The machine-readable medium of Claim 1 where said plurality of manufactured features are simulated manufactured features.

8.   A machine-readable medium for programming a computer to determine feature relating tolerance consumed for a plurality of manufactured holes on an object, said medium comprising processor executable instructions for
5   determining a true position for each of said plurality of manufactured holes;

determining a center for each of said plurality of manufactured holes;

superimposing each of said true positions to form a one true
10   position;

determining the centers of each of said plurality of manufactured holes relative to said one true position;

determining a circle that intersects or contains each of said centers;
15   determining the diameter of said circle;

determining feature relating tolerance consumed from said

diameter.

9.   The machine-readable medium of Claim 8 where said processor executable instruction of determining a center for each of said plurality of manufactured holes comprises

acquiring dimensions of said manufactured holes with a
5   coordinate measuring machine; and

determining the center of said manufactured holes from said dimensions.

10.   The machine-readable medium of Claim 8 where said plurality of manufactured holes are simulated manufactured holes.

11.   The machine-readable medium of Claim 8 where said processor executable instruction of determining feature relating tolerance consumed from said diameter comprises

determining a feature relating tolerance circle; and
5   comparing said diameter with said feature relating tolerance circle.

12.   A machine-readable medium for programming a computer to determine feature relating tolerance consumed for a plurality of manufactured features on an object where at least one additional feature is added to a pattern of features, said medium comprising processor executable instructions for
5   determining a true position for each of said plurality of manufactured features;   -

determining a location for each of said plurality of manufactured features;

organizing each of said true positions into a single association;
10   organizing the location of each of said plurality of manufactured features relative to said single association;

determining a first circle that intersects or contains each location;

determining the location of said additional feature;

determining if the location of said additional feature is contained

15   within said first circle;

determining a second circle that intersects or contains said plurality of manufactured features and said additional feature, if said additional feature is not contained with said first circle;

determining the diameter of said second circle; and

20   comparing the diameter of said second circle with said feature relating tolerance to determine acceptability of the pattern.

13.   The machine-readable medium of Claim 12 where said manufactured feature comprises a hole.

14.   The machine-readable medium of Claim 12 where said processor executable instruction of determining a second circle that intersects or contains said plurality of manufactured features and said additional feature, if said additional feature is not contained with said first circle comprises

5   identifying said additional feature;

determining a center of said additional feature;

determining a second circle that intersects or contains the centers of said manufactured features.

15.   The machine-readable medium of Claim 12 where said plurality of manufactured features are simulated manufactured features.

16.   A machine-readable medium for programming a computer to determine used feature relating tolerance consumed for a plurality of manufactured features on an object, said medium comprising processor executable instructions for

5   determining a true position for each of said plurality of manufactured features;

determining a center for each of said plurality of manufactured features;

organizing each of said true positions into a one true position;

10   organizing the center of each of said plurality of manufactured features relative to said one true position;

determining a departure circle about each of said centers; and

determining a circle that is tangent to or contains each of said departure circles.

17.   The machine-readable medium of Claim 16 where said step of determining a true position for each of said plurality of manufactured features comprises determining the designed center for each of said manufactured features.

18.   The machine-readable medium of Claim 16 where said step of determining a departure circle about each of said centers comprises determining a difference in diameter from the minimum hole diameter allowable for a feature in a pattern.

19.   The machine-readable medium of Claim 16 where said step of determining a circle that is tangent to each of said departure circles comprises

providing a plurality of internal manufactured features; and

determining a circle that contains or is tangent to a near side of
5   each departure circles.

20.   The machine-readable medium of Claim 19 where said internal feature is a hole.

21.   The machine-readable medium of Claim 16 where said step of determining a circle that is tangent to or contains each of said departure circles comprises

providing a plurality of external manufactured features; and

5   determining a circle that contains or intersects each of said departure circles.

22.   The machine-readable medium of Claim 21 where said external feature is a pin.

23.   The machine-readable medium of Claim 16 where said plurality of manufactured features are simulated manufactured features.

24.   A machine-readable medium for programming a computer to determine whether a pattern of features violates a pattern locating tolerance for a plurality of manufactured features on an object, said medium comprising processor executable instructions for

5   determining a true position for each of said plurality of manufactured features;

determining a center for each of said plurality of manufactured features;

organizing each of said true positions into a one true position;

10   organizing the center of each of said plurality of manufactured features relative to said one true position;

determining a departure circle about each of said centers; and

determining where said departure circles lie relative to a pattern locating tolerance circle.

25.   The machine-readable medium of Claim 24 where said step of determining a departure circle about each of said centers comprises

determining a difference in diameter from the minimum hole diameter allowable for a feature in a pattern.

26. The machine-readable medium of Claim 24 where said step of determining if said departure circles lie outside a pattern locating tolerance circle comprises

determining a pattern locating tolerance circle;

5   centering said pattern locating tolerance circle about said one true position; and

determining whether any portions of said departure circle lie outside of said pattern locating tolerance circle .

27. The machine-readable medium of Claim 24 where said step of determining if said departure circles lie outside a pattern locating tolerance circle comprises

determining a pattern locating tolerance circle for a plurality of

5 simulated manufactured features;

centering said pattern locating tolerance circle about said one true position; and

determining whether all of said departure circle lies outside of the pattern locating tolerance circle.

28. The machine-readable medium of Claim 24 where said plurality of manufactured features are simulated manufactured features.

29. A system in a manufacturing site, said system comprising a computer and a coordinate measuring machine adapted to determine whether a pattern of manufactured features violate a pattern locating tolerance, and adapted to determine feature relating tolerance consumed for said pattern of

5 features, said system adapted to perform the steps of

determining a true position for each of said plurality of manufactured features;

determining a center for each of said plurality of manufactured features;

10   organizing each of said true positions into a one true position;

organizing the center of each of said plurality of manufactured features relative to said one true position;

determining a departure circle about each of said centers;

determining if any of said departure circles lies outside a pattern

15   locating tolerance circle to determine if said pattern locating tolerance is violated;

determining a circle that contains each of said departure circles; and

comparing a diameter of said circle to said feature relating

20   tolerance to determine acceptability of the pattern.

30.   The system of Claim 29 where said feature comprises an internal feature.

31.   The system of Claim 29 where said feature comprises an external feature.

32.   The system of Claim 31 where said step of determining a circle that contains each of said departure circles comprises a circle that is tangent on the far side of each departure circle.

33.   The system of Claim 29 where said feature relating tolerance is represented as a circle.

34.   The machine-readable medium of Claim 28 where said

manufactured features are simulated manufactured features.

35.   A method for determining feature relating tolerance consumed for a plurality of manufactured features on an object comprising:

determining a true position for each of said plurality of manufactured features;

5   determining a location for each of said plurality of manufactured features;

organizing each of said true positions into a single association;

organizing the location of each of said plurality of manufactured features relative to said single association;

10   determining a circle that intersects or contains each location;

determining the diameter of said circle; and

comparing the diameter of said circle with said feature relating tolerance to determine acceptability of the pattern.

36.   The method of Claim 35 where said manufactured feature comprises an external feature.

37.   The method of Claim 35 where said processor executable instruction of determining a true position for each of said plurality of manufactured features comprises:

determining a designed center for each of a plurality of

5   manufactured internal features.

38.   The method of Claim 35 where said processor executable instruction of determining a true position for each of said plurality of manufactured features comprises:

determining a designed center for each of a plurality of

5   manufactured external features.

39.   The method of Claim 35 where said processor executable instruction of organizing the location of each of said plurality of manufactured features relative to said single association comprises organizing the location of manufactured holes relative to a one true position.

40.   The method of Claim 35 where said plurality of manufactured features are simulated manufactured features.

41.   A method to determine used tolerances for a plurality of manufactured features on an object comprising:

        determining a true position for each of said plurality of manufactured features;

5   determining a center for each of said plurality of manufactured features;

        organizing each of said true positions into a one true position;

        organizing the center of each of said plurality of manufactured features relative to said one true position;

10   determining a departure circle about each of said centers;

        determining a first circle that is tangent to each of said departure circles; and

        comparing said first circle to a magnitude of a feature relating tolerances.

42.   The method of Claim 41 where said step of determining a true position for each of said plurality of manufactured features comprises determining the designed center for said manufactured feature.

43.   The method of Claim 41 where said step of determining a first circle that is tangent to each of said departure circles comprises

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providing a plurality of internal manufactured features; and

determining a circle that is tangent to a near side of each

5   departure circle.

44.   The method of Claim 43 where said internal manufactured features are holes.

45.   The method of Claim 41 where said step of determining a circle that is tangent to each of said departure circles comprises

providing a plurality of external manufactured features; and

determining a circle that is tangent to a far side of each departure

5   circle.

46.   The method of Claim 45 where said external feature is a pin.

47.   The method of Claim 41 where said plurality of manufactured features are simulated manufactured features.